

September 21, 2017

Marlene H. Dortch  
Secretary, Office of the Secretary  
Federal Communications Commission  
445 Twelfth Street, SW  
Room TW-A325  
Washington, DC 20554

**Re: Hammer Fiber Optics Investments, Ltd.**  
***Ex Parte Notice***

***Expanding Flexible Use in Mid-Band Spectrum Between 3.7 & 24 GHz***  
GN Docket No. 17-183

***Use of Spectrum Bands Above 24 GHz for Mobile Radio Services***  
GN Docket No. 14-177  
IB Docket No. 15-256  
RM-11664  
WT Docket No. 10-112  
IB Docket No. 97-95

***Application of Verizon Communications Inc. and Straight Path Communications Inc.  
for Transfer of Control of Licenses***  
ULS File No. 0007783428

Dear Ms. Dortch:

On behalf of Hammer Fiber Optics Investments, Ltd. (“Hammer”), we submit this *ex parte* notice of our meeting on September 19, 2017, with Kevin Holmes, Acting Legal Advisor, Wireless and Public Safety, Office of Commissioner Brendan Carr. Lisa Chandler Cordell of Breisach Cordell PLLC, along with Mark Stogdill, Hammer’s Chief Executive Officer, attended this meeting.

As outlined in more detail in the enclosed materials distributed at the meeting, we discussed Hammer’s innovative hybrid fiber/wireless system that recently launched using leased LMDS spectrum to provide triple-play service. In addition, we explained how Hammer and its unique technology are working to help bridge the digital divide with service to underserved and unserved areas, as well as to provide a competitive broadband service to large incumbent providers that presently dominate the broadband market. This is important as the Commission has before it proceedings that look to make changes to various spectrum bands to allow for 5G technology, as well as applications that, if granted, will entrust an already dominant provider

with control over LMDS and other wireless licenses that currently are the subject of Spectrum Manager Leasing Arrangements.<sup>1</sup>

Please let us know if you have any questions or concerns.

Sincerely,

A handwritten signature in blue ink that reads "Lisa Chandler Cordell".

Lisa Chandler Cordell  
*Attorney for Hammer Fiber Optics  
Investments, Ltd.*

Enclosures

cc: Kevin A. Holmes, Acting Legal Advisor, Wireless and Public Safety, Office of  
Commissioner Brendan Carr

cc: Hammer Fiber Optics Investments, Ltd.

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<sup>1</sup> In light of Verizon Communications' commitment to honor existing lease arrangements, we noted that Hammer does not object to Verizon's acquisition of LMDS licenses from Straight Path Communications.

**Hammer Fiber Optic Investments, Ltd.**  
**September 19, 2017**

**COMPANY OVERVIEW**

- ❖ Wholly-owned subsidiary of Hammer Fiber Optics Holdings Corporation, a publicly traded company
  - Board members include Donald (Don) MacNeil, former COO of XO Communications
  - Key executives have extensive experience in engineering and construction of fiber networks for major providers, such as Verizon FiOS, Google Fiber and others
- ❖ Residential and commercial services provider
  - Residential triple-play service provider
  - Business solutions - fiber transit solutions, VoIP platforms, Ethernet connectivity and managed services
- ❖ Flexible business model – can serve urban, suburban, as well as underserved rural, areas
  - Dual delivery methods
    - Fiber-to-the-premise (*e.g.*, urban environments)
    - Fiber backbone with wireless last mile solution where fiber-to-the-premise is not economically feasible (*e.g.*, underserved rural areas)
  - Uses off-the-shelf customer premises equipment (FTTP and hybrid fiber/wireless solution)
    - Internet- Standard DOCSIS 3.0 (scalable to DOCSIS 3.1) modems
    - VoIP – uses existing phones through direct connection with included ATA
    - Video – can be viewed on a variety of WiFi-capable devices or via set-top boxes within the home

**HAMMER’S WIRELESS BROADBAND SYSTEM**

- ❖ Hybrid fiber/wireless architecture
  - Fiber optic backbone
    - New Jersey - 400 miles connecting New York and Philadelphia with data centers throughout New Jersey

- Proprietary wireless last mile solution based on MMDS architecture
  - Offers downstream speeds of 300 Mbps or greater with no network congestion during peak usage times
  - Uses Frequency Division Duplexing (FDD) for upstream and downstream, requiring 2 frequency bands for operation with 200 MHz spacing between upstream and downstream edge frequency
  - Uses base station with sector antennas designed for 90° coverage, typically placed as high as possible in a centralized location. Sectors can be placed next to each other alternating polarization from horizontal to vertical to achieve greatest arc of coverage, even 360° coverage, while avoiding interference with neighboring antennas.

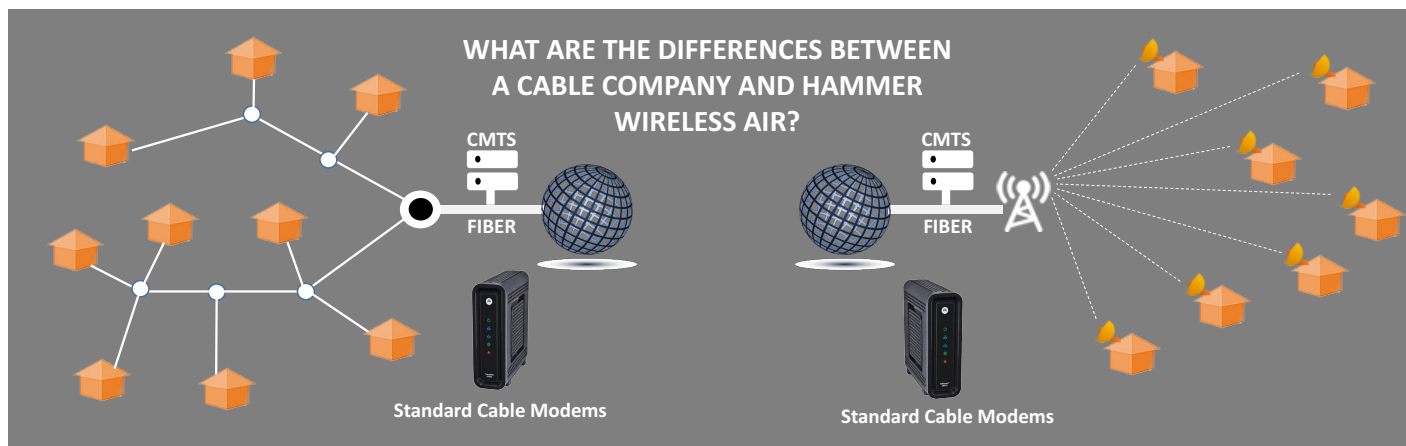
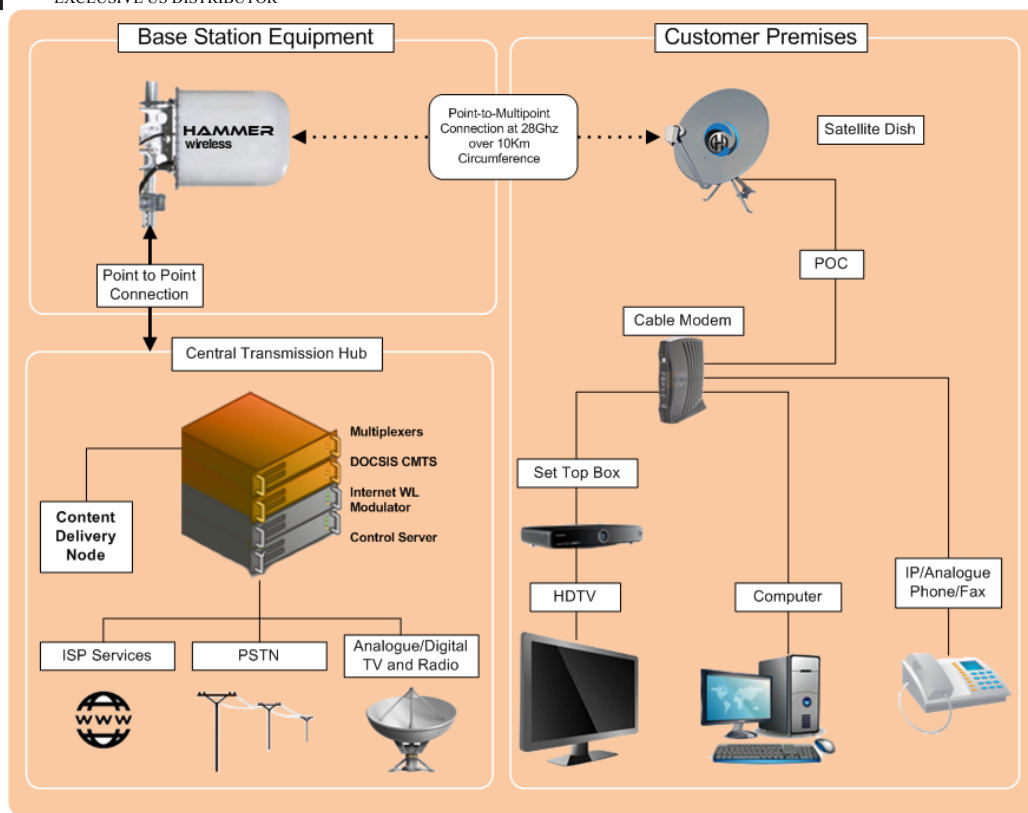
## **HAMMER FIBER AIR**

- ❖ Proprietary technology – bi-directional transceiver installed at the customer’s premise communicates with a fixed base station, capable of bonding small non-contiguous channels across various spectrum allocations.
- ❖ Hammer considers its system as a pre-5G architecture and is working towards 5G standards, including LTE compatible service over 500 MHz-wide broadband channels to fixed LTE subscriber modems and LTE small cells utilizing mmWave or Ka/Ku band spectrum. This LTE component is already functional in internal laboratory testing.
- ❖ Can function across a wide range of frequencies between 6 GHz and 39 GHz
  - LMDS spectrum (28 and 31 GHz)
    - Identified LMDS spectrum as viable for use with Hammer Fiber AIR before 2016 FCC Spectrum Frontiers Order approving LMDS spectrum for 5G technology
    - Spectrum Manager Leasing Arrangement with Straight Path since late 2015
      - Hammer has invested substantial private capital in reliance on continued availability of LMDS spectrum
      - Current sectors are located in BTA 25 (Atlantic City, NJ), but given Straight Path’s large holdings of LMDS spectrum, Hammer had a master agreement that allowed, and Hammer planned, to add other areas
  - 12 GHz
    - Recently partnered with Go Long Wireless, a Sarasota, Florida company that holds 12 GHz MVDDS spectrum in 49 markets
      - Hammer plans to introduce triple-play services targeted in largely underserved rural areas
      - Awaiting FCC approval of adding MVDDS spectrum to 5G spectrum band





EXCLUSIVE US DISTRIBUTOR



| DESCRIPTION OF NETWORK                         | CABLE COMPANY              | HAMMER WIRELESS         |
|--|----------------------------|-------------------------|
| Maximum bandwidth over DOCSIS 3.0 modem        | Up To 300 Mbps             | Up To 300 Mbps          |
| Cost of Network Roll Out                       | \$4,000 to \$6,000 per Sub | Less Than \$600 per Sub |
| Start to Finish 2,500 homes Deployed           | 18 months                  | 3 months                |
| Television Services Delivery                   | Set Top Box                | Set Top Box             |
| Television HD / 4K content / Telephone Service | YES                        | YES                     |
| DOCSIS 3.0 and 3.1 Compliant                   | YES                        | YES                     |

## Wireless.

Hammer Wireless AIR uses a proprietary distribution system designed from the ground up based on Multichannel Multipoint Distribution System (MMDS) architecture, which is currently making use of the LMDS spectrum. The system runs DOCSIS 3.0 (scalable to DOCSIS 3.1) and utilizes standard DVbX for video delivery. The system utilizes Frequency Division Duplexing (FDD) for upstream and downstream, requiring two frequency bands for operation with 200 MHz spacing between upstream and downstream edge frequency. Deployment uses a base station with sector antennas designed for 90-degree coverage, typically placed as high as possible (i.e. on a cell tower or atop a building) in a centralized location. Sectors can then be placed next to each other, alternating polarization from horizontal to vertical to avoid interference with neighboring antennas in order to achieve a greater arc of coverage, or even a 360-degree coverage area. The system requires line of sight to the premises where a transceiver is installed using a standard satellite dish. The transceiver is then connected to a cable modem or gateway via coaxial cable.

## Unique Technology.

The Hammer Wireless Air patented technology is made up of two components – a base station radio for P2MP connections to Hammer Transceivers located at a customer's premises. Our technology includes the following features that makes it a truly unique distribution system and permits a wide range of uses.

### **EFFICIENT USE OF SPECTRUM**

Can receive 2 separate incoming signals at the same time, which allows spectrum in different frequencies and channels to be processed in one transceiver.

### **WIDE RANGE OF FREQUENCIES**

Can function across a wide range of frequencies between 6GHz and 39GHz.

### **CHANNEL BONDING CAPABILITY**

Has the ability to bond individual, small non-contiguous channels into one contiguous 450MHz wide channel.



*Above and right are actual images from a Hammer Wireless deployment in Atlantic City.*

## The Atlantic City Deployment.

Our wireless technology has been deployed on Absecon Island, including Atlantic City, NJ. This deployment uses leased spectrum, 28GHz for the downstream and 31 GHz for the upstream. With three towers, coverage is expected to reach roughly 90% of Absecon Island (about 35,000 homes passed).

The deployment has been successful, averaging two new installs daily, and customers are reporting 300+ Mbps downstream and 100+ Mbps upstream.

## Frequency Allocations.

Hammer Wireless Air has been in R&D for use in the following spectrum combinations:

| Downstream frequency range in GHz | Upstream frequency range in GHz |
|-----------------------------------|---------------------------------|
| 4.9 – 6.5                         | 16.5 – 18.6                     |
| 10.0 – 11.5                       | 4.0 – 5.2                       |
| 10.0 – 11.5                       | 4.9 – 6.5                       |
| 10.0 – 11.7                       | 10.5 – 12.7                     |
| 10.0 – 11.7                       | 10.0 – 11.7                     |
| 11.5 – 12.7                       | 4.9 – 6.5                       |
| 11.5 – 12.7                       | 4.9 – 6.5                       |
| 11.7 – 12.7                       | 10.0 – 10.8                     |
| 11.5 – 12.7                       | 4.9 – 6.5                       |
| 12.6 – 13.5                       | 4.9 – 6.5                       |
| 12.7 – 14.8                       | 10.0 – 11.0                     |
| 24.0 – 25.0                       | 26.0 – 27.0                     |
| 16.0 – 24.0                       | 26.0 – 28.0                     |
| 26.0 – 29.0                       | 30.0 – 32.0                     |



311 Broadway  Point Pleasant Beach, NJ 08742

[www.hammerfiber.com](http://www.hammerfiber.com)

[www.hammerwireless.com](http://www.hammerwireless.com)

[www.hammerfiberopticinvestments.com](http://www.hammerfiberopticinvestments.com)

1(844)413-2600

(732)333-3808